skin had been destroyed by moth. The present was therefore the first authentic introduction of the *Surnia ulula* into this country. The Hawk-Owls of America and Europe were, Mr. Sharpe said, scarcely distinct species, but tolerably recognizable races.

Tne following Papers were read :—

1. Notes on the Anatomy of *Plotus anhinga*. By A. H. Garrod, M.A., F.Z.S., Prosector to the Society.

(Plates XXVI., XXVII., XXVIII.)

The Darter is one of those birds whose anatomy, with the exception of its skeleton, is comparatively little known ; I therefore take the present opportunity of describing the organs and some of the most important muscles of *Plotus anhinga* from the two specimens which were recently living in the Society's collection, and which, from my prosectorial advantages, it has been my good fortune to be able to dissect.

On December 28th, 1872, the Society became possessed, for the first time, by purchase, of a male specimen of *Plotus anhinga*, which died on the 17th of this month, with general jaundice and distention of the gall-bladder from obstruction of the common bile-duct. The second specimen, a female, was purchased on the 30th of September, 1875 ; it was never quite healthy, and died on the 7th of February, without any special organic lesions, but with a dropsical condition of the subcutaneous areolar tissues, frequently found in Steganopod birds. It is this second specimen which I first dissected ; and the other coming to hand, opportunely for me, has enabled me to verify my observations.

Pterylographically, there is nothing for me to add to the results arrived at by Nitzsch[*]. The skin is not in the least pneumatic, in which respect it contrasts greatly with *Sula* and *Pelecanus*, and agrees with *Phalacrocorax*.

With reference to the anatomy of its circulatory organs, it is to be noted that *Plotus anhinga* possesses only a single carotid artery, the left. In *Sula bassana, Phalacrocorax carbo* and *P. lugubris, Fregata aquila*, and *Phaethon* there are two. In *Sula fusca* (a specimen in very bad immature plumage from Port Lemon, Porto Rico) the left carotid only exists, as also in *Pelecanus rufescens* and *P. onocrotalus*.

As to the respiratory organs, from Plate XXVIII. fig. 3 it can be seen that the syrinx is in no way peculiar, a single pair of intrinsic lateral muscles being present. By the side of it I have figured the lower portion of the windpipe of a male Gannet (*Sula bassana*), in which a pair of fatty bodies are developed just above the bifurcation of the bronchi, the like of which I have not elsewhere seen.

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[*] Pterylography, Ray Society's Translation, edited by P. L. Sclater, F.R.S., p. 151.

Osteologically *Plotus anhinga* deserves some special attention.
Brandt * in his valuable memoir on avian anatomy has fully
described and figured the skeleton. Nevertheless from his draw-
ing of the vertebræ of the cervical region it is evident that he was
not thoroughly acquainted with the peculiarities of their mutual
articulation.

Eyton † describes briefly the osteology of *Plotus novæ-hollandiæ*,
but does not give figures. The specimen he refers to is in the Col-
lege-of-Surgeons' Museum (No. 1179 A). His drawing of *Phalacro-
corax cristatus* ‡, however, makes it apparent that he fully realizes
the peculiarity of the mutual relationships of the cervical vertebræ
in its close allies.

W. Donitz § draws attention to a peculiarity in the cervical region
of *Plotus levaillantii* which will be referred to further on. This
peculiarity is not represented in Brandt's figure of *P. anhinga* ; and
it is not to be found in either of the Society's specimens, one being
at least three and a half years old.

In speaking of *Phalacrocorax cristatus* Mr. Eyton remarks,
" The tubercle on the upper edge of the occipital bone has a pointed,
movable, triangular process attached to it, which I suspect has also
been the case with my specimen of *Plotus*, but has been lost."

In the Society's female specimen there is a fibro-cartilaginous
similarly situated process, not more than one sixth of an inch long,
which is ossified in the evidently older male. In his notes on the
anatomy of the Cormorant, Hunter tells us ‖ that " a small bone,
about an inch long, passes back from the os occipitis and gives
origin to the temporal muscle, which is very strong." The same
bone in the Darter, although comparatively not so long, performs
the same function, the superfical temporal muscles meeting behind
the skull along the median raphe, which becomes ossified to form the
above-mentioned bony style in the adult bird. (See Plate XXVIII.
fig 1 *a*.)

Before commencing the description of the cervical articulations of
the Darters, it may be mentioned that the same condition is observed,
only in a less marked degree, in the Cormorants, and still less in the
Gannets and Pelicans.

The first eight cervical vertebræ (including the atlas and axis),
when articulated together in such a way that all the articular sur-
faces are in their proper relations one to the other, form a continuous
curve with a strong concavity forwards. So considerable is this
curve, that when the beak of the bird is horizontal the axis of the
peculiarly long eighth vertebra is parallel to that of the skull, or
very nearly so. The curve is not a part of a circle, but is one
which gradually augments in acuteness from above downwards, its
most considerable development being between the 7th and 8th ver-
tebræ, which are consequently articulated at a considerable angle

* Mémoires de l'Acad. Imp. des Sciences de St. Pétersbourg, tom. v. 6ème
Série, Sect. d. Sc. Nat. 1839.
† Osteologia Avium, p. 218.   ‡ *Loc. cit.* pl. v. f. 1.
§ Archiv für Anat. u. Physiol. 1873, p. 357.
‖ Essays and Observations, edited by Prof. Owen (1861), vol. ii. p. 328.

with one another, more strongly marked than that between the 6th and 7th, and this, again, more decided than that between the 5th and 6th, and so on.

The 8th and 9th vertebræ articulate so as to form an angle exactly the opposite in direction—namely, with its genu directed forwards instead of backwards. The same is the case with the 9th and 10th, the 10th and 11th, the 11th and 12th, the 12th and 13th; more slightly so between the 13th and 14th, and the 14th and 15th; whilst the 15th and following until the last (the 20th), which with the one above it carries imperfect ribs, form almost a straight line with one another, being slightly bowed, with the convexity directed backwards.

With the exception of the atlas and the 6th and 7th, the cervical vertebræ are peculiarly elongate, the 8th being more so than the others, as may be seen in Plate XXVI. fig. 1.

Donitz figures a pair of accessory bony bridges on the dorsal surface of the vertebra following the most lengthy one, which must evidently therefore be the 9th. He, however, speaks of it as the 8th, which seems to me to be an error depending on the omission of the consideration of the atlas, because in *Plotus anhinga* (both from Brandt's figure and my specimens) it is most certainly the 9th, as it is in *Plotus novæ-hollandiæ, Phalacrocorax carbo*, and *P. lugubris*. I have, however, not seen *Plotus levaillantii*.

Donitz attributes the peculiar kink in the neck of the Darters, which it is impossible to obliterate without lacerating the surrounding muscles, to the presence of the bony bridges he describes; in this, however, he is mistaken, it depending on the above-mentioned peculiarity in the 8th cervical vertebra, by which it is angularly articulated with the 7th and 9th vertebræ, the upper genu being posterior, and the lower anterior. In further verification of this, it may be stated that in *P. anhinga* the bony bridges do not exist, and yet the kinking is most strongly marked.

Myologically the cervical region of the Darter is very peculiar, on account of the great concentration of its muscular mechanism towards the thoracic end of that segment of the body, the tendons from them running lengthy courses up the neck. The anterior and the posterior cervical muscles will be considered separately.

Anterior cervical region.—Normally in birds the *longus colli anterior*, or great front flexor muscle of the neck, commences as a series of thin tendinous slips from the middle of the bodies of the first two or three vertebræ which carry complete ribs (true dorsals). The fibres diverge and ascend in such a manner that they form a bilateral median mass acutely triangular at its lower end. They receive continual accessions from the bodies and hæmapophyses of the cervical vertebræ, ending in slips which are attached, successively, to the apices of the anterior transverse processes three or four higher than the vertebræ whence they sprang. Through the whole length of the cervical region they are of very similar mass, and therefore help to maintain the otherwise fairly uniform diameter of the vertebral column *.

* *Vide* Owen on *Apteryx*, Trans. Z. S. vol. iii. pl. 33, p. 310.

In *Plotus* this uniformity is considerably disturbed, irrespective of the above-described kink, by the excessive development of the *longus colli* in its lower almost interthoracic portion, as well as, though to a less degree, by the enlargement of the *longus colli posterior* behind.

In *Plotus anhinga*, as above stated, there are 20 cervical vertebræ. A small slip of the *longus colli* arises from the body of the third dorsal vertebra, which is inserted into the transverse process of the 17th cervical. Above, and in contact with this, is another similar slip to the 16th cervical. From the bodies of the 2nd and 1st dorsal vertebræ, as well as from the antero-median portions of the six lower cervical vertebræ, a large muscle arises on each side, in layers (somewhat resembling the layers formed by the basally expanded petioles of an onion bulb)—the lower being partially en- closed in the upper—which ultimately form a bipenniform mass with a tendon running axially through it and continually receiving additions in the form of outer coverings of tendinous tissue arising from the enclosing muscles, till it forms a strong single tendon which courses up the front of the neck, close to the middle line on each side, to be inserted into the downward-directed, peculiarly long hæmapophysial spine of the 8th cervical vertebra, and gives off slips, on its way up, to the serially homologous processes of the 9th and 10th vertebræ. A similar tendinous slip to the 11th vertebra has an independent origin from the bodies of the 15th and 16th verte- bræ, internal to the main muscular mass, which is almost the size of a lemon, and with its fellow of the opposite side, of much the same shape, filling up and projecting beyond the slight anterior con- cavity above mentioned, formed by the mutual articulations of the 15th, 16th, 17th, 18th, and 19th cervical vertebræ. (In Plate XXVI. figs. 1 & 2, these different details are clearly shown.)

Posterior cervical region.—Here there is an exaggerated develop- ment of muscle in the juxta-thoracic part, opposite the similar enlargement in front, although it is not so considerable behind. The *longus colli posterior* is the muscle which is excessively de- veloped. It becomes differentiated from the posterior dorso-spinal mass opposite the 14th and 15th cervical vertebræ to run up the neck in the form of a fleshy belly which receives additional origins, in the form of muscular slips, from the vertebræ as high as the 9th cervical. Where the slip from the 10th vertebra (which is a small one) joins it, the muscle becomes tendinous, forming a rounded cord, to the inner side of which the large fasciculus from the 9th vertebra is attached.

A reference to the account given above of the disposition of the vertebræ in this region will make it evident that the tendon of the *longus colli posterior* must make a considerable backward turn op- posite the transverse line of articulation between the 8th and 9th cervicals—because there the two bones meet at a considerable angle, *with the genu directed forwards.* This being the case, some special mechanism is essential to prevent the tendon from breaking away from the vertebral column when the muscle with which it is

associated contracts.   In fact, a pulley has to be formed round
which the tendon may turn in the same manner that at the knee,
in birds, the *biceps cruris* is able to act upon the fibula from a point
situated some way down it, because it is bound close to the greatly
bent knee-joint by the well-known sling-band in that region.   In
Plate XXVI. figs. 1 & 2, the sling-band here described is clearly
shown.

A similar sling-band is found in the posterior cervical region of
those birds which have any great backward curve of the neck, it in
the Gannets being also associated with the 9th vertebra.   It is
nothing more than a specialization and strengthening of the aponeu-
rosis which is always found covering the muscles, opposite the
place where the strain occurs.   In *Phalacrocorax carbo* the general
sheath is strong, and no specialized band can be distinguished.

In *Plotus anhinga* this sling-band is attached at its inner end,
with its fellow of the opposite side, to the middle line of the posterior
surface of the neural arch of the 9th vertebra, about halfway be-
tween its proximal and distal extremities ; whilst at its outer end it
is fixed to the tubercle which is situated just outside the upper arti-
cular process of the same vertebra, a backward and slanting loop of
tendinous tissue joining the two (*vide* Plate XXVI. figs. 1 & 2).

It is the ossification of this just-described tendinous loop which
constitutes Donitz's bridge in *P. leraillantii* and *P. novæ-hollandiæ*.
In neither of the Society's specimens of *P. anhinga*, nor in that
figured by Brandt, nor in a specimen of the same species seen by
Donitz himself, is this bridge ossified.   It may therefore be that in
P. anhinga it remains tendinous ; or, less probably, it has happened
that the four specimens inspected have none of them been adult birds.
One is at least $3\frac{1}{2}$ years old, we know.

Through this bridge, as has been briefly described by Donitz, from
a dried specimen, the tendon of the *longus colli posterior* passes—
which it does before it receives the considerable fleshy fasciculus
originating from the neural arch of the ninth vertebra, as is rendered
evident in Plate XXVI. figs. 1 & 2.

The tendon, augmented by fibres from the just-mentioned addi-
tional origin, passes up the back of the neck, side by side with its
fellow, to end by being inserted into the posterior surface of the
lower articular process of the axis vertebra, it, in its course, sending
small tendinous slips to the corresponding parts of the third and
fourth cervical vertebræ.   The tendon is peculiar in being ossified
where it is opposite the bodies of the vertebræ with which it is re-
lated, and supple at the joints, which makes it appear to be com-
posed of alternate bony and fibrous elements when it is removed from
the body.   From the fifth, fourth, and third vertebræ short
muscular fibres ascend to join the corresponding portions of the
main tendon in single penniform series.

It is nearly always the case in avian anatomy that the inner fibres
of the cervical portion of the *longus colli posterior* muscle become
differentiated to form the *digastrique du cou* of Cuvier, better known
to us as the *biventer cervicis,* a muscle one peculiarly interesting

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modification of which, in the genus *Ceryle* among the Alcedinidæ, has been described and figured by Dr. Cunningham in the Society's 'Proceedings'*. This, by the way, I may mention, I have had the opportunity of fully verifying. Meckel, in his 'General Treatise on Comparative Anatomy,' tells us† that he found it at its minimum of development in the Gallinæ, the Goose, and the Cormorant. In a specimen of *Sula fusca*, as well as in *Phalacrocorax carbo*, it is present, but extremely small, I find. It is entirely absent in *Plotus anhinga*, the *longus colli posterior* (*cervicalis ascendens*, Meckel) entirely ceasing at the lower margin of the axis vertebra, in the tendon above described.

There are other myological features deserving of special notice in the thoracic and crural regions of the Darters.

The *great pectoral* muscle is composed of two independent layers :—a superficial large one, arising from the inferior border of the sternum, its carina, and from the outer border of the furcula ; and a deep one from the upper two thirds of the deeper part of the carina, superficial to the *pectoralis secundus,* and from the symphysial half of the outer border of the furcula. The superficial layer is inserted by a broad linear attachment to the pectoral ridge of the humerus, whilst the deep layer ends in a rounded tendon which commences at the axillary margin of the triangular muscle, with which it is associated, and receives the fibres of the remainder of the muscle in its course to its attachment into the lower end of the pectoral ridge of the humerus, beyond the insertion of the lowest fibres of the superficial layer. In Plate XXVII. this arrangement is clearly indicated. A condition exactly similar to this is observed in *Phaëthon, Pelecanus, Sula,* the Cathartidæ, all the Storks, and the Petrels, and in no other birds as far as I am aware. In *Phalacrocorax* it is not easily recognized.

As in *Phalacrocorax* and *Phaëthon,* but not in *Sula* or in *Pelecanus,* the *biceps* muscle of the arm sends a fleshy slip to the middle of the patagial tendon of the *tensor patagii longus* (Plate XXVII. *b. s*).

No trace of the *expansor secundariorum*‡ muscle could be detected.

As in all the other Steganopods, the *tensor fascia* of the thigh does not cover the *biceps cruris* in the least.

The *ambiens* is of fair size ; it deeply grooves the large ossified patella ; and some of the fibrous ligament overlapping this groove shows traces of ossification ; so that in aged birds the groove may be converted into a foramen, as is always the case in *Phalacrocorax,* where the thus formed foramen is far from superficial (*vide* Plate XXVIII. figs. 5, 6, & 7). In a specimen of *Pelecanus rufescens* the *patella* was not ossified.

The *semitendinosus* is very large, composed of parallel fibres, and without any accessory head developed to join it. The *femoro-caudal* also, as in all other true Steganopods, lacks an *accessorius* ; it closely

* P. Z. S. 1870, p. 280.
† French edition, Paris, 1829–30, vol. vi. p. 11.
‡ *Vide ante,* p. 193.

resembles that muscle in *Sula* and *Pelecanus*, being separated from the *obturator externus* by a well-marked interval, which is not the case in *Phalacrocorax**. It is to be remembered, as I have had the opportunity of stating elsewhere†, that in *Fregata aquila* the *semi-tendinosus* is entirely absent, as in the Accipitres, whilst in *Phaëthon* it has an accessory head as well as a considerable bulk itself, these facts tending strongly to verify Brandt's division of the Steganopods ‡ into three well-differentiated groups, of two of which the two above-named genera are the only examples.

The alimentary canal of the Darter presents features of especial interest, as in its stomach there is a modification in the structure of the proventriculus not referred to in zoological works generally. It is fully described by Mr. Macgillivray in Audubon's 'Ornithological Biography' §, where an excellent figure illustrates the account. Mr. Macgillivray also accurately describes most of the other viscera. He, however, omits to refer to the hairy mat in the second stomach, which latter viscus, he strangely says, is soft and smooth inside. The observations here made, which are in accordance with those of Mr. Macgillivray, cannot be considered *de trop*, as the extremely abnormal conformation he describes required verification before it could be accepted as not being merely an individual peculiarity.

The *tongue*, as an independent organ, does not exist. It is very small in all Steganopods, but free at its anterior extremity ; smallest proportionally in *Pelecanus*. In *Plotus*, however, it is not free at its apex, it forming merely a longitudinal groove along the middle of the floor of the mouth, and ending abruptly behind by a small transverse slightly projecting ridge, $2\frac{1}{4}$ inches in front of the *rima glottidis*, which is evidently the rudiment of the base of the organ. The hyoid cornua, $1\frac{1}{2}$ inch long, running in the faucial membrane, here meet and blend.

There is no *crop* ; the œsophagus, however, is very dilatable. The *proventriculus* does not form a zone, as is the rule : nor does it form a patch, as in *Struthio, Rhea, Chauna,* and a few other birds ; but it forms a special gland-cavity into which the individual constituents of the organ open. This cavity communicates with the digestive tube by a small orifice which is situated on the right side of the stomach, just below the commencement of the yellow dense characteristic epithelium of the stomach in birds. Plate XXVIII. fig. 2 will assist in rendering this explanation more distinct.

The proventricular compartment is covered by peritoneum, is nearly globose, about the size of a chestnut, and fixed to the right side of the lower end of the œsophagus. On superficial inspection it looks very like an enlarged spleen (that organ being subglobose in birds). Its cavity is very small, being much encroached upon by the great depth of the cylindrical glands which compose its walls. The yellow stomach-epithelium surrounds its orifice and goes no further. There are no indications of additional proventricular glands at the lower

* *Vide* P. Z. S. 1873, p. 636.
† P. Z. S. 1873, p. 636, and 1874, p. 122.
‡ P. Z. S. 1874. p. 116.   § Vol. iv. p. 158.

termination of the œsophagus, the epithelium in that part being quite smooth and apparently squamous.

This further development in *Plotus* of a special and well-differentiated gland-organ from what in other birds is a zone or a simple circular patch of glands, is very similar to the equally uncommon development of the cardiac gland-organ in the stomach of the Manatee, which is most certainly only a modification of the similarly situated gland-patch in the Dugong.

The stomach is not developed into a gizzard, its walls in no part exceeding one sixth of an inch in thickness. It is divided into two compartments, a cardiac and a pyloric, as is that of the Pelican. The former of these corresponds to the gizzard in most birds, the latter to the imperfectly formed cavity associated with the pyloric valve in the Storks, Gannet, &c. (*vide* Plate XXVIII. fig. 2).

Of the stomach of the Pelican, Hunter tells us* that "it is oblong, much in the direction of the œsophagus, with a little curve, smallest at the lower end : it makes a quick turn and swells again into a round bag ; or it may be supposed that from the side near the lower or smaller end is attached a bag whence the duodenum arises." In the Catalogue of the Museum of the Royal College of Surgeons (1852), Prof. Owen† remarks, with reference to a specimen (No. 519) of the stomach of a Pelican (*Pelecanus onocrotalus*), "The œsophagus is continued into the proventriculus or glandular cavity, without any marked constriction ; and the latter passes insensibly into the part analogous to a gizzard. This part communicates by a transverse aperture with a small globular cavity, which is lined by a vascular membrane, and communicates with the duodenum by a very small oblique aperture. This superadded cavity renders the analogy between this stomach and that of the Crocodile complete, with the exception of the absence in the latter of distinctly developed gastric glands. These, in the Pelican, are simple elongated follicles, closely compacted together, and extended over a large surface." In *Plotus* the second cavity is similarly situated, intervening between the stomach proper and the duodenum. The dense yellow epithelium of the one, however, extends into the other, right up to the pyloric valve. [It may be that in the specimen described by Prof. Owen the lining had been previously stripped off, which may have led to the term vascular being applied to the mucous membrane of the second stomach.]

Hunter, in his dissection of *Sula* and *Phalacrocorax*, does not mention the existence of a second stomach ; and I have not observed or found recorded such an arrangement in either of those genera, or in *Phaëthon*, or in *Fregata*.

In *Plotus* there is still another peculiarity which, as far as I know, is found in only one other bird, namely *Cathartes aura*. In Audubon's ' Ornithological Biography ' ‡, Mr. Macgillivray tells us that in the stomach of *C. aura* "there is a pyloric lobe [second com-

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* Essays and Observations, Owen's edition, 1861.
† Vol. i. " Organs of Motion and Digestion," p. 148.
‡ Vol. v. p. 340.

partment] about half an inch in diameter, which is lined with bristly hairs. They are all inserted at right angles to the surface, penetrate to the base of the epithelium, and are of various lengths, some of them not protruding beyond the surface, others upwards of half an inch, of various colours, some black, generally tipped with whitish, others light greyish yellow, all thick at the base, and tapering to a fine point. Being disposed in a regular manner, they might seem to form a part of the organization of the stomach, and not to be, like the hairs found in *Cuculus canorus* and *Coccyzus americanus,* merely extraneous." The pyloric orifice in *Plotus anhinga,* as is seen in Plate XXVIII. fig. 2, is protected by a mat of lengthy hair-like processes, much like cocoa-nut fibre, which nearly half fills the second stomach. This second stomach is globose, and nearly an inch in external diameter. Its dense lining-membrane is raised into short rugæ and tubercles, as is that of the first ; and it is evidently a modification of the epithelium which develops these tubercles in the region of the pylorus which gives rise to the above-mentioned mat-sieve. The hairs composing the mat are hispid, slender, and about half an inch long. They arise from a surface a little less than a square inch in area round the pylorus, which is in its centre. They cease at the very margin of the small circular orifice, where the commencement of the delicate mucous membrane of the duodenum can be just seen. My friend, Mr. E. A. Schäfer, Assistant Professor of Physiology at University College, has very kindly examined these hairs microscopically, and tells me that " they are much more like true hairs, both in structure and mode of attachment, than they are like the epithelial projections which are so often met with over the filiform papillæ of the human tongue, which, at first sight, they much resemble. Like hairs, they consist of an outer 'cuticular' part, and an inner 'fibrous' part ; and in some places there is also yet another substance running along the middle of the fibrous part, which might be compared to the medulla of a hair. The cuticular part is much thicker in proportion than that of a cutaneous hair, and forms here and there dentate projections at the sides of the filament. The cuticle is continuous with the horny superficial portion of the stratified epithelium which covers this part of the stomach ; in neither can the outlines and nuclei of the component cells be distinctly seen, the cells having blended into a nearly homogeneous substance. That portion of the hair which extends below this into the deeper layers of the epithelium, appears not to be covered with a prolongation of the cuticle, but to be formed only of the fibrous part. This last-named seems, like the fibrous or cortical constituent of a cutaneous hair, to be composed of a closely set bundle of much elongated cornefied epithelial cells, slightly larger than those of a cutaneous hair, and with their extremities not fusiform (as in that) but truncated. The number in a cross section varies according to the size of the filament. They may, in many, be seen projecting at the end a little beyond the cuticular part.

" The roots of the gastric hairs are so closely set as to occupy the greater portion of the mucous membrane, so that the connective

tissue of the corium, which occupies the intermediate space, is very small in amount. Between the tissue and the hair-root is seen a layer of columnar epithelium cells, which in some places are of considerable length. They are continuous towards the surface with the deeper cells of the stratified epithelium. They represent the ' root-sheaths ' of the cutaneous hair, and seem to have undergone a horny meta-morphosis.

" At their extreme ends the roots are entirely different from those of the cutaneous hairs. There is no hair-knob and no papilla ; but the root generally breaks up into two, three, or more short rootlets, each of which tapers to a pointed extremity. This, at least, is the appearance in vertical section ; but transverse sections show that this branching of the hair-root has, at all events in the first instance, more of a laminated character.

" These rootlets are covered by a layer of cubical epithelium cells, which are continuous with the columnar cells surrounding the hair-root. The latter, as before remarked, is formed merely by the fibrous substance or cortical portion of the hair ; and the fibres which com-pose this would therefore seem to be in some way produced by these cells.

" Some few hairs seem to end by a single tapering rootlet, but most of them spread out and branch in the way described."

This peculiar hairy mat must act as an excellent sieve to prevent the entrance of solid particles, fish-bones, &c. into the narrow in-testines.

The small intestine is 55 inches long in the female, and 40 inches in the male ; and it is not capacious. The duodenal loop measures 5 inches in each limb. The left lobe of the bilobed liver is about half the size of the right ; and a gall-bladder of considerable size is present. The large intestine is 6 inches long in the female, and 3 inches in the male. There is only a single cæcum, exactly like that in the Ardeidæ, in my specimens. This conformation of cæcum is found in no other Steganopod bird, there being two cæca in all the other genera. These, in *Pelecanus,* are a little over an inch in length, in *Sula* slightly shorter, whilst in *Phalacrocorax, Fregata,* and *Phaëthon* they are simple knob-like bodies, nearly globose in form. The rudiment of the vitelline duct is persistent.

In the distance of its diminutive cæcum from the cloaca (in other words, in the length of the large intestine) *Plotus* differs slightly from its allies. In *Pelecanus* the large intestine is under 2 inches in length ; and it is much the same in *Sula.* In *Phaëthon* it does not exceed a quarter of an inch in length. It, however, differs con-siderably in my two specimens, being in both longer than the same in Audubon's specimen.

In the urino-genital system of *Plotus anhinga,* in both sexes, the ducts open in the normal manner into the cloaca, just above its lower orifice. This orifice, however, is not on the surface, but is into a cavity, behind the cloaca, which opens externally quite close to the place where the two communicate. Except for this nearly marginal orifice the second cavity is a cæcal sac, oval in shape, and about

$1\frac{1}{2}$ inch high, covered at its blind end with the crypts of shallow glands, which also run down its sides. That it is a modification of the *bursa Fabricii* cannot be doubted.

EXPLANATION OF THE PLATES.

PLATE XXVI.

Fig. 1. View of left side of neck of *Plotus anhinga*, dissected.   *l.c.a.* longus colli anterior muscle ; *l.c.p.* longus colli posterior muscle. The fibrous representative of Donitz's bridge is seen attached to the ninth cervical vertebra.

  2. View of part of the posterior region of the neck of *Plotus anhinga*. The roman figures refer to the cervical vertebræ counted from the head. Donitz's bridge is seen attached to the ninth ; and at *a* is also seen a fibrous band, which is of similar function, attached to the eleventh. At *b* is seen the fasciculus of the tendon of the posterior neck-muscle which traverses the fibrous loop, which latter has been removed on the left side.

PLATE XXVII.

View of the anterior thoracic region of *Plotus anhinga*, dissected to show the superficial (*p* 1, 1) and deep layer (*p.* 1, 2) of the pectoralis major muscle on the right side, as well as the pectoralis minor (*p.* 2) on the left. The insertion of the deeper layer of the pectoralis major is seen to be surrounded by the much more considerable mass of the similar portion of the superficial stronger layer. The triceps (*t*) and the biceps (*b*) of the cubitus are seen on the right side, as is the patagial slip (*b. s*) of the latter. The sternum (*st.*) is superficially bound to the lower end of the coracoid bone by the anterior sterno-coracoid ligament (*ant. st. cor. lig*), which is particularly powerful in the Steganopods and Storks.

PLATE XXVIII.

Fig. 1. View of top of head of *Plotus anhinga*, showing the occipital style (*a*) and the temporal muscle (*t*) arising from it on one side.

  2. Stomach of *Plotus anhinga*, inside view.

  3. Anterior view of the lower end of the trachea in *Plotus anhinga*.

  4. The same in *Sula bassana*.

  5 & 6. Top and side view of the patella in *Phalacrocorax carbo*, showing the canal for the ambiens muscle. *N.B.* The side view (fig. 6) is accidentally drawn with the base uppermost.

  7. Front of patella in *Plotus anhinga* deeply grooved by ambiens muscle.

2. Remarks on a Hybrid between the Black Grouse and the Hazel Grouse. By H. E. DRESSER, F.Z.S.

Amongst the Gallinaceous birds, and especially amongst the Ducks, we not unfrequently find wild hybrids ; and not a few of these hybrids have during the last year or two been exhibited at the meetings of this Society—but none, I may almost venture to say, so interesting as the bird I have now the pleasure to exhibit before the meeting ; for there can be no doubt that it is a wild cross between the Black Grouse (*Tetrao tetrix*) and the Hazel Grouse (*Bonasa betulina*), a cross that has, so far as I can ascertain, never yet been recorded.   The *Rackelvogel* of the Swedes, the hybrid between the Capercailly and the Black Grouse, is by no means uncommon, especially in places where the males of the Capercailly have been